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(54) Abstract Title
Crib member for mine support crib

(57) A crib member 1 for a mine support crib comprises a main body part composed of a plurality of parts 2 fixed together, and an interlocking part composed of a plurality of block members 7,8,10,11. The block members are joined to the main part so as to provide spaces 5 which are used to interlock adjacent crib members. The inner surfaces of the outer block members 7,10 may be inclined.

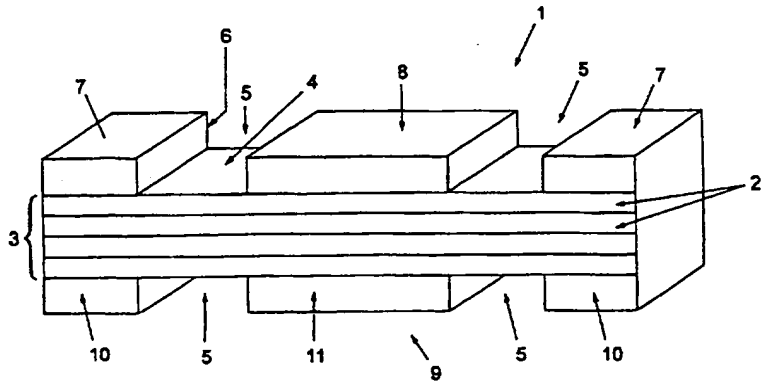

Fig. 1

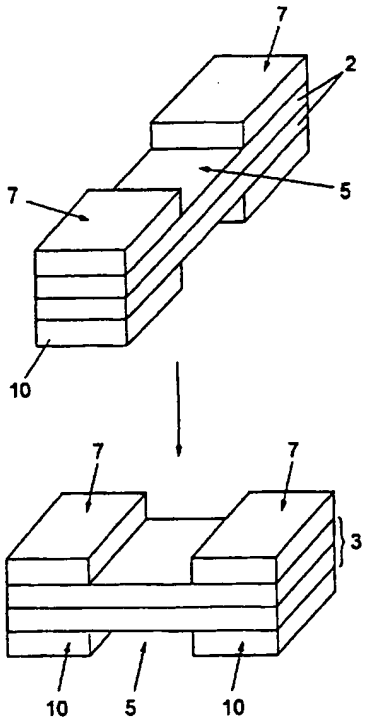

Fig. 6a

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The reference to figures 6, 7a, 7b, 8 of the drawings in the printed specification are to be treated as omitted under Section 15(2) or (3) of the Patents Act 1977

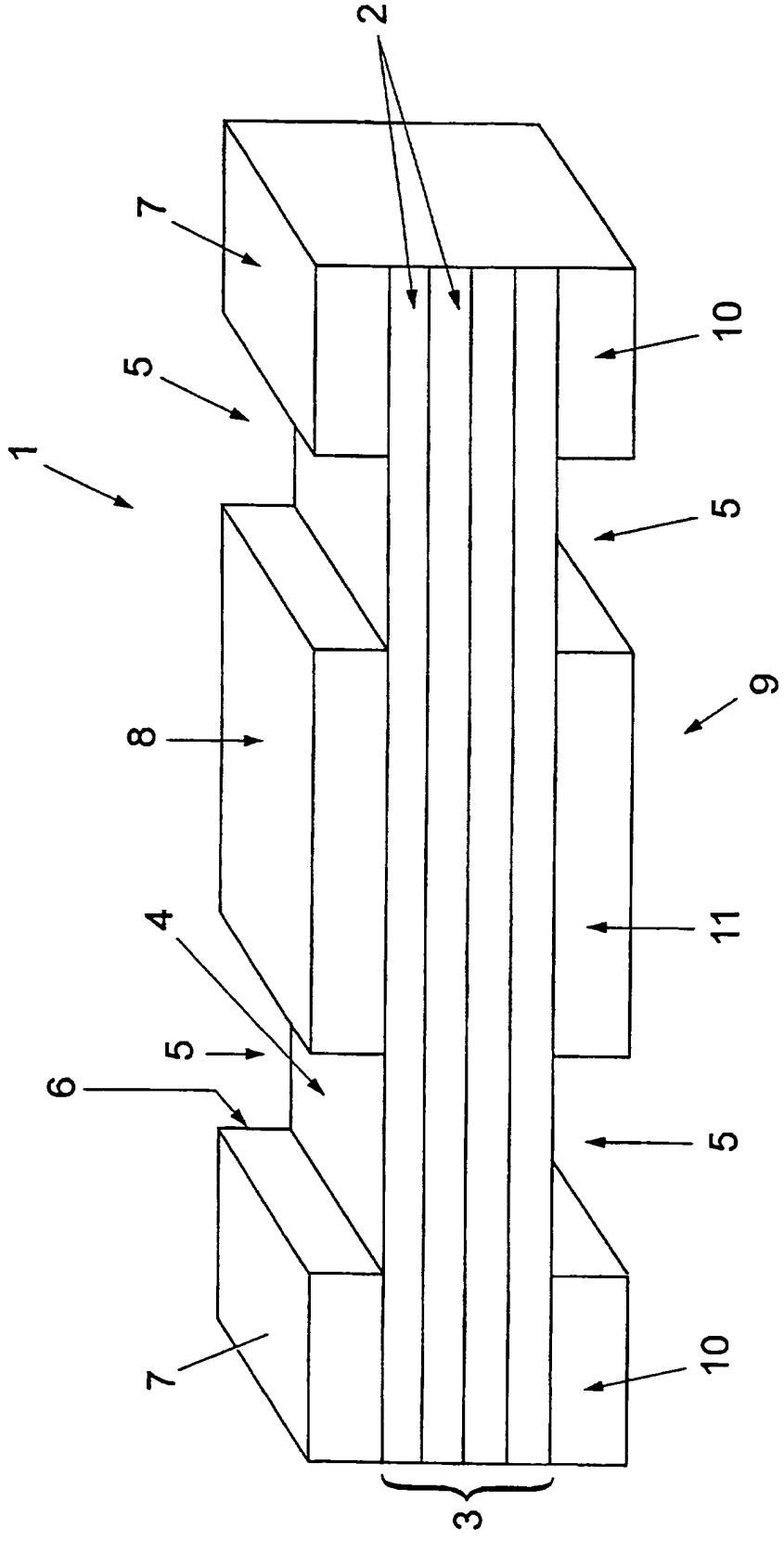

Fig. 1

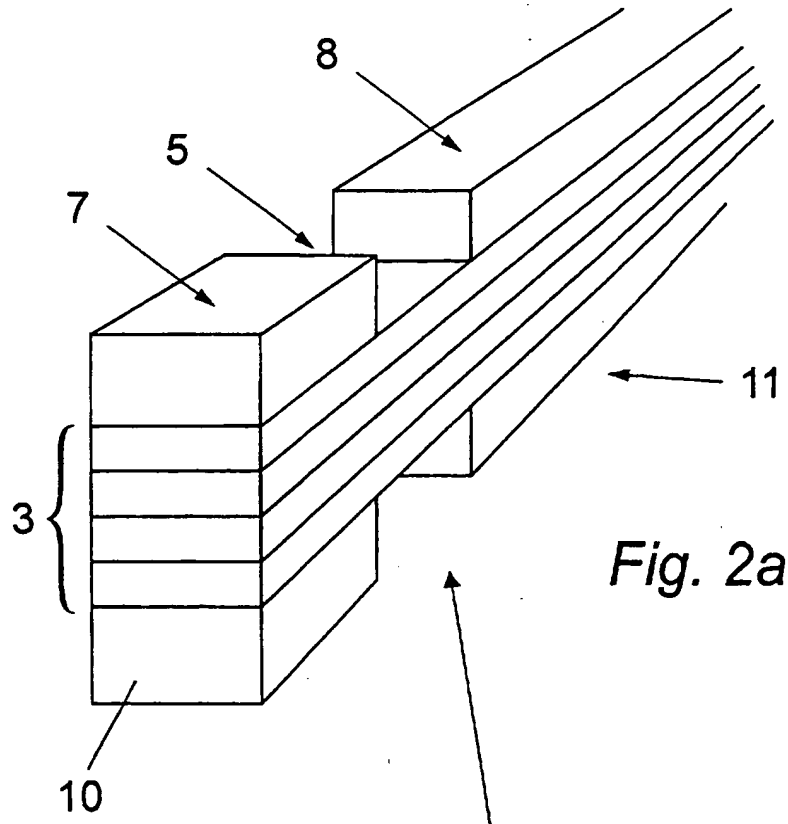

Fig. 2a

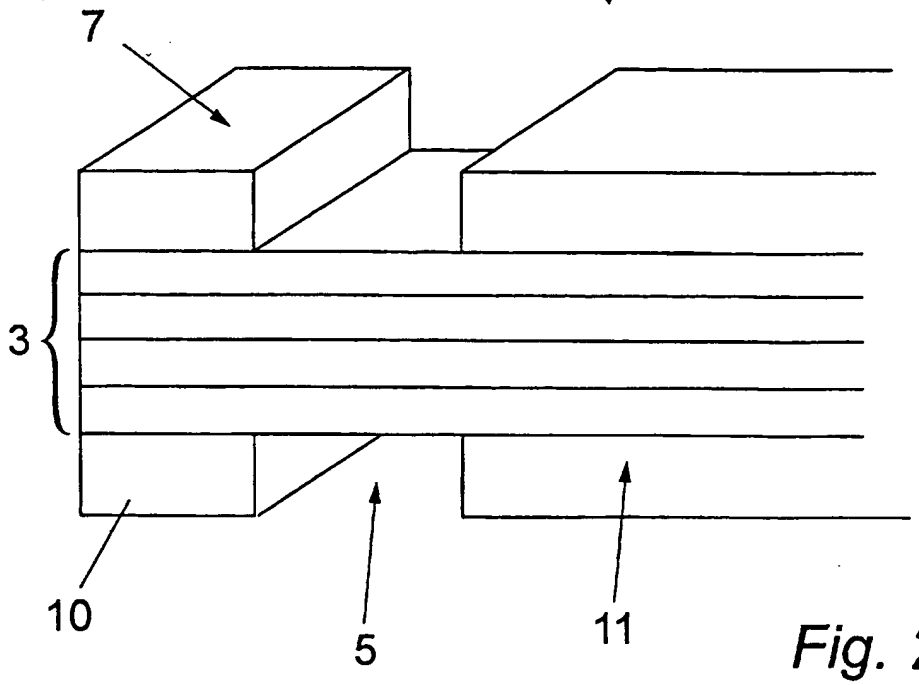

Fig. 2b

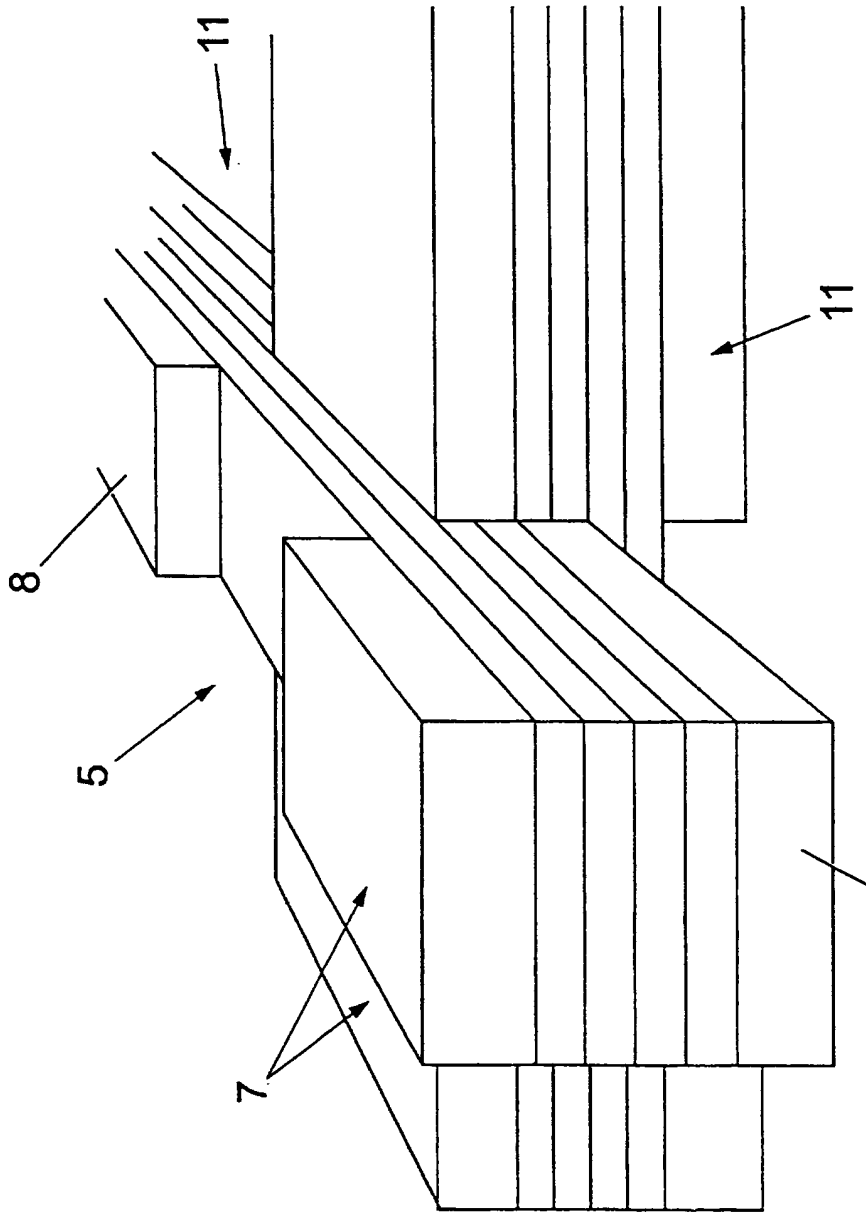

Fig. 3

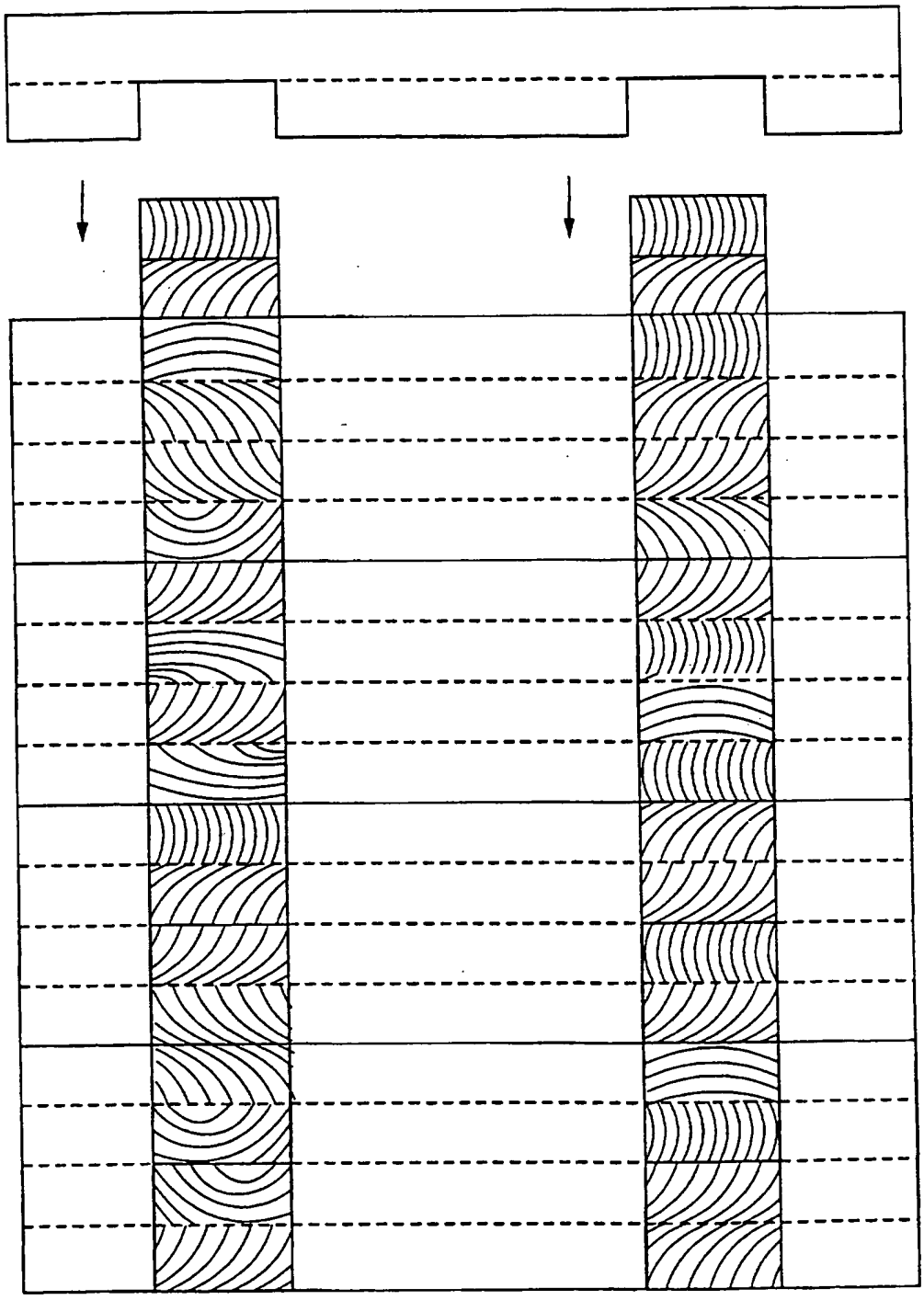

Fig. 4

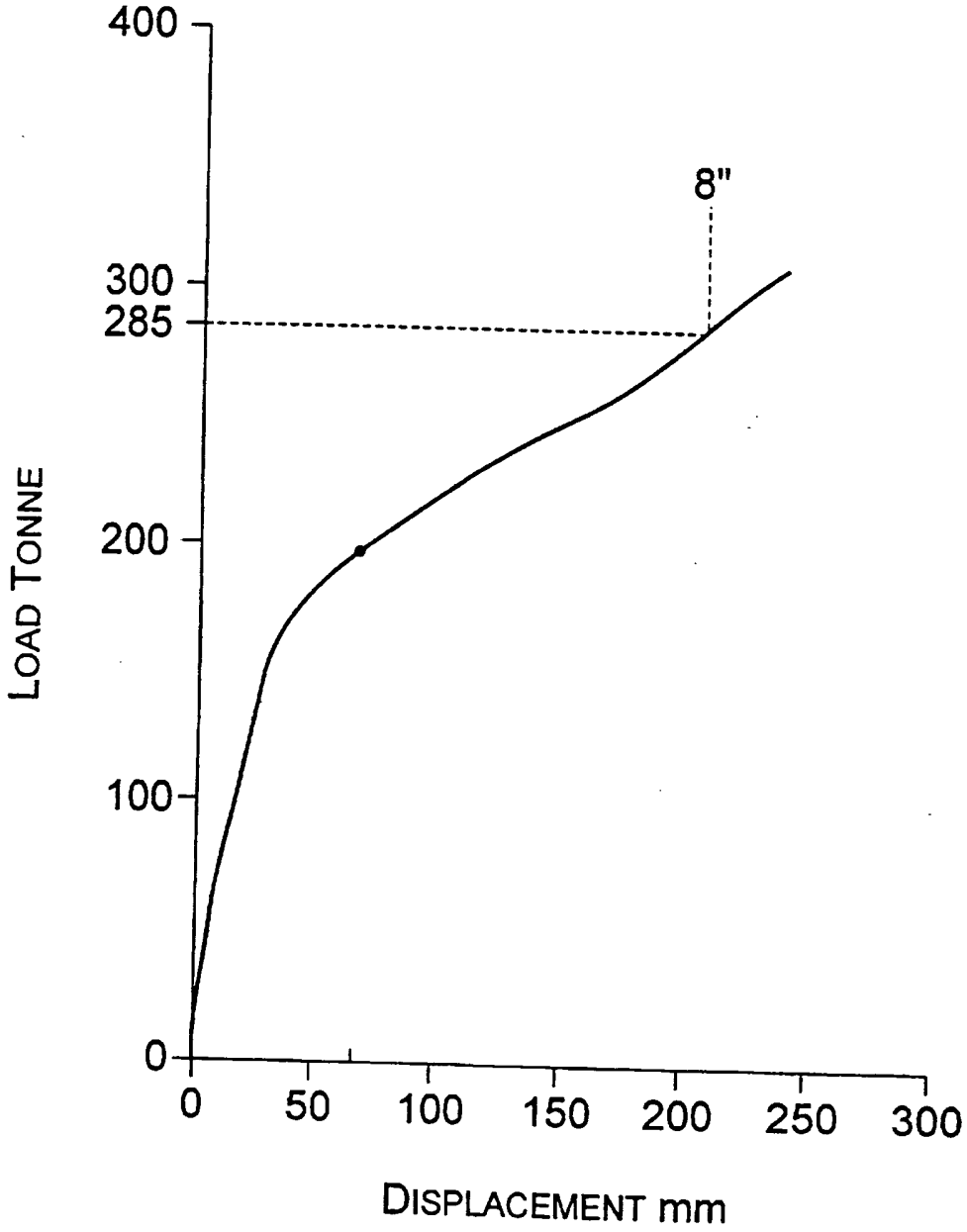
400
300
285
200
100
0
8"
LOAD TONNE
0
50
100
150
200
250
300
DISPLACEMENT mm

Fig. 5

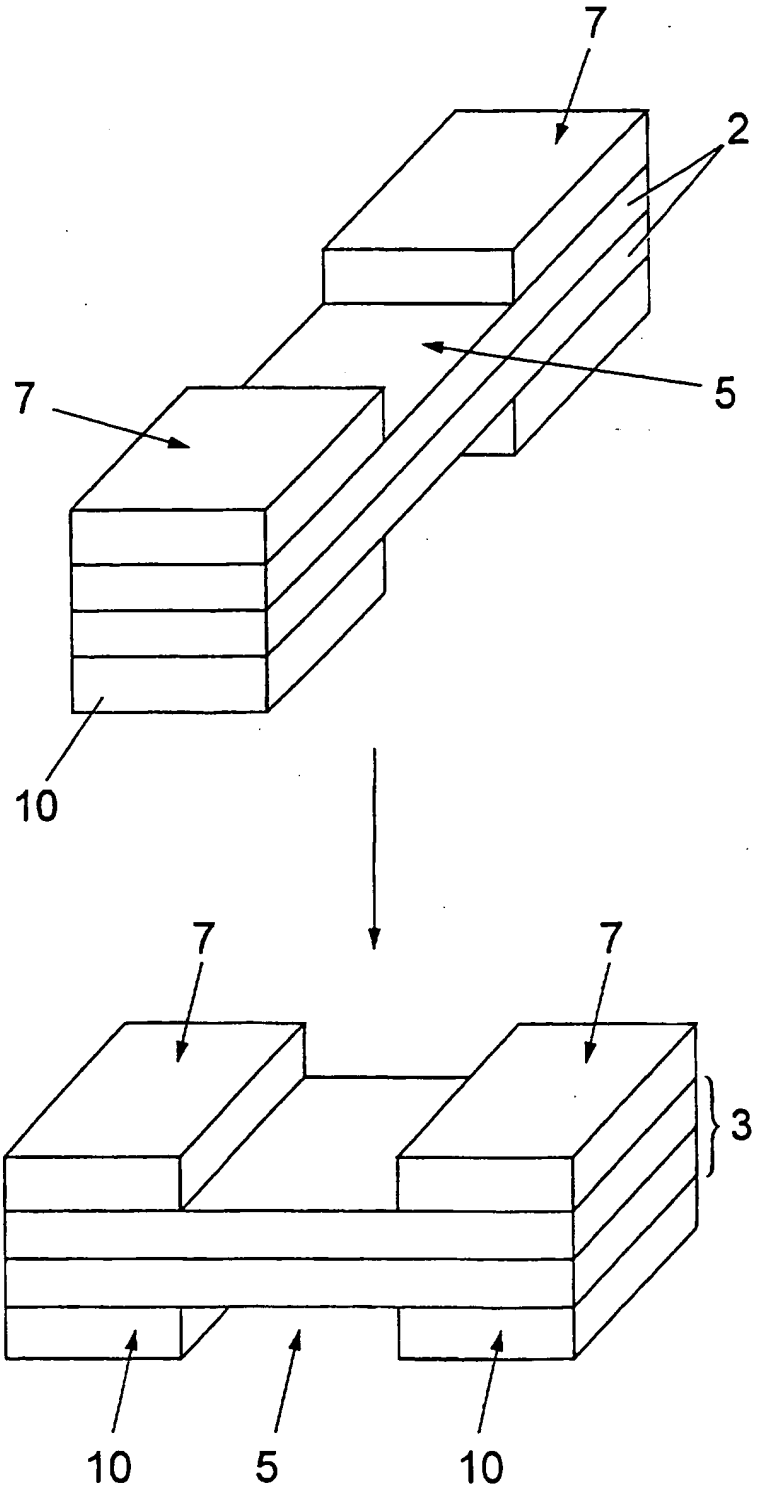

Fig. 6a

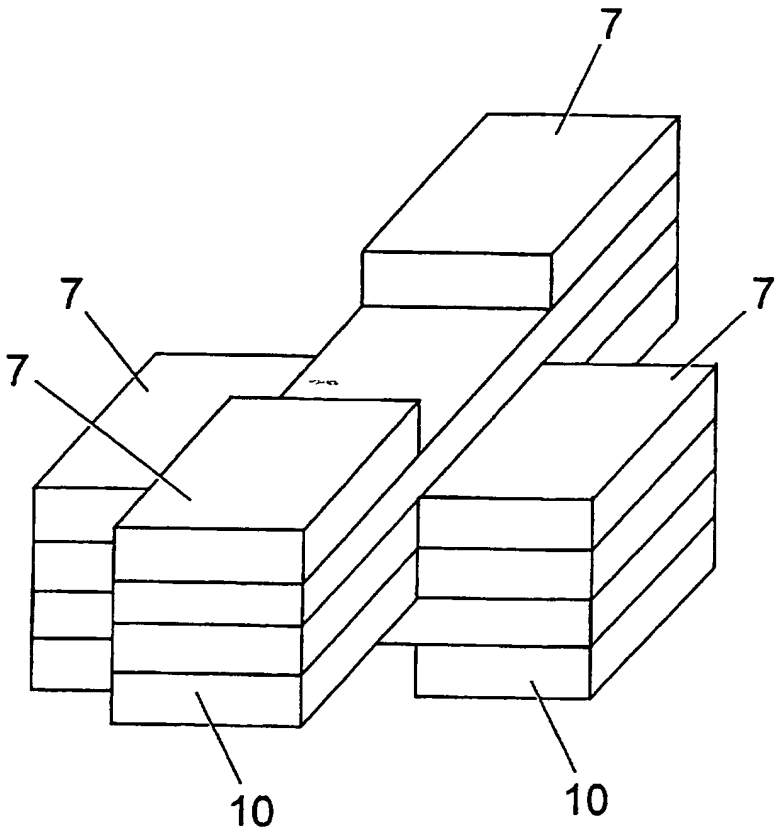

Fig. 6b

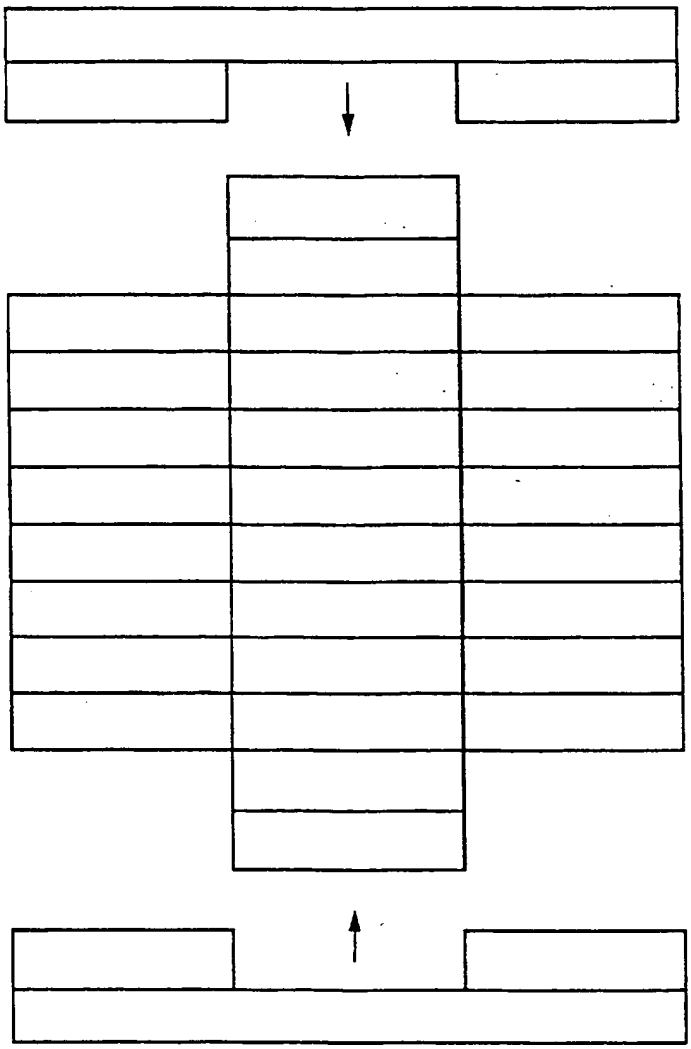

Fig. 6c

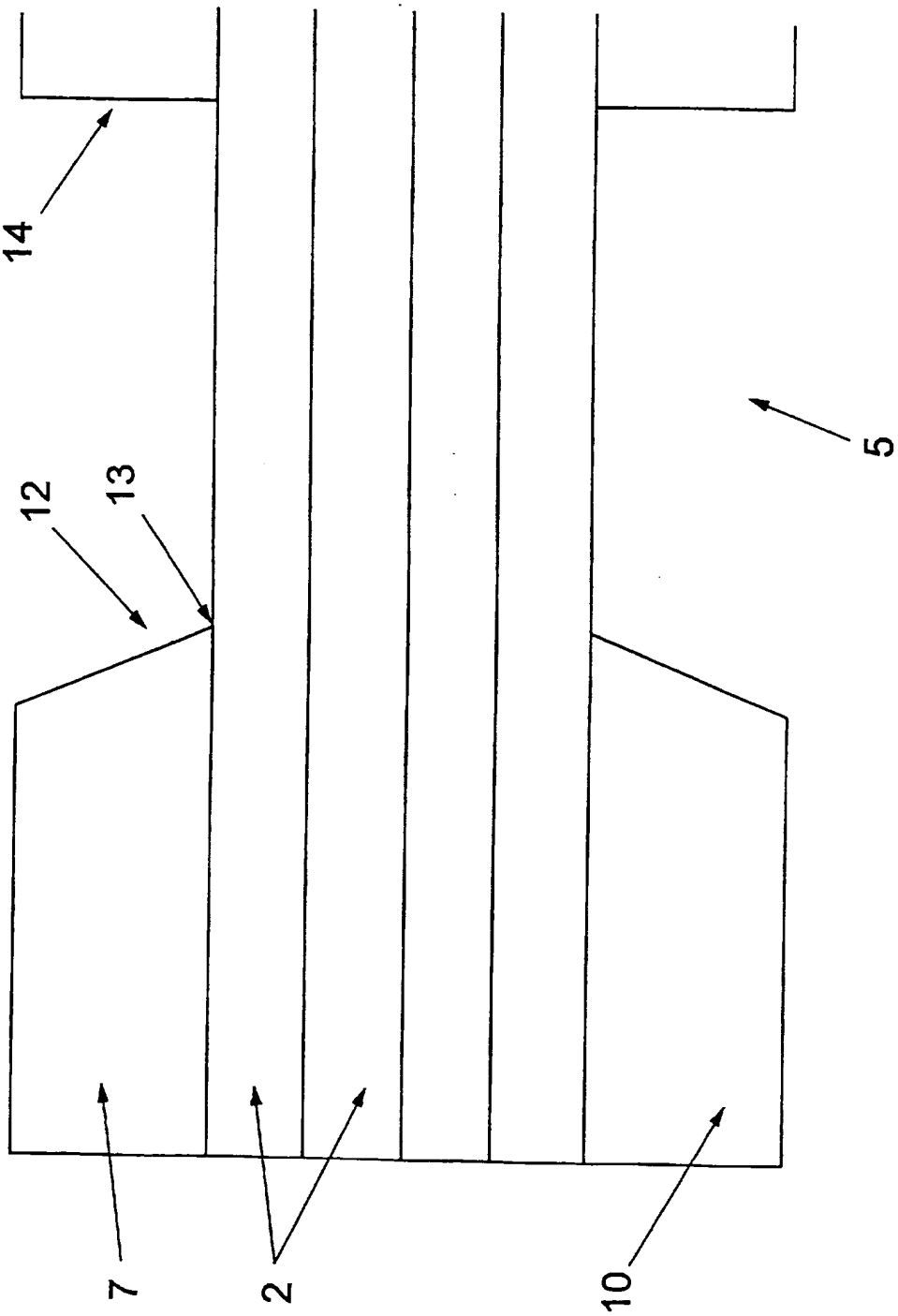

Fig. 7

SUPPORT SYSTEM

The invention herein described relates to a support system and component parts thereof; and a method for constructing said support system, wherein said support system is for use particularly, but not exclusively, in supporting mine tunnels and/or other subterranean excavations.

Underground excavation has a number of potentially hazardous consequences for those that work in shafts, tunnels and caves, including, for example, explosions due to gas leakage, damage to respiratory tissue due to inhalation of particulate material and tunnel collapse through excavation. The last of these hazards represents arguably the most common cause of death and injury to those that work underground.

During excavation work, a tunnel is gradually extended and requires internal support to prevent its roof collapsing thereby causing death and injurying to the excavators. It is therefore important to provide a support means that can be rapidly constructed, ideally *in situ*, and which is sufficiently robust to withstand the massive loads which are imposed from the ground above.

Prior art supports are known, examples of which are described in US 5 143 484, US 5 435 670 and US 5 746 547. Typically these are referred to as mine support cribs.

US 5 143 484 discloses the use of stacked car tyres. Ideally each car tyre is filled with concrete so as to provide improved compression resistance. The concrete filled tyres, once set, are stacked at a selected site in a tunnel to support to the tunnel roof. However, this tyre support crib has major disadvantages. Firstly, although concrete provides advantageous compressive

strength it does have a tendency to crumble and distort when exposed to the sorts of pressures typically imposed from on a subterranean structure. This can result in collapse of the tunnel. Secondly, the concrete filled tyres are of a considerable weight and therefore are not easily manipulated. Thirdly, the uniform dimensions of the tyres used in the crib support do not facilitate their construction into a mine support crib; the height of a tunnel may not correspond to the combined height of a number of tyres resulting in workers needing to construct the crib using wedges etc to secure the crib at the roof surface. Fourthly, the tyres are a fire hazard.

An arguably more sophisticated crib is described in US 5 435 670. The crib comprises three separate parts; a "spacer", a "pack" and an "inflatable bag" (into which material may be deposited to interface between the roof and pack). In the assembled crib the pack is placed on top of the spacer and the inflatable bag is placed on top of the pack. The inflatable bag advantageously allows the crib to be elevated to an operational height by varying the amount of material deposited in the bag. The preferred material is a settable grout. However the crib still has disadvantages. The spacer and pack are manufactured from timber. Timber, although resilient, is prone to compression, especially when exposed to the magnitude of compressive forces that typically act on subterranean mine structures. This results in an shortening in the height of the crib and the need to either replace the inflatable bag or alternatively to add more grout to the existing bag. Each option is undesirable since, as mentioned above, settable grout, as with concrete, has a tendancy to crumble and distort, and further since, grout requires a period of time to cure before it can provide adequate compressive strength. This renders the tunnel vunerable to collapse before it sets.

US 5 746 547 describes a crib composed of a series of elongate identical chocks which are mounted on one another during construction to provide a

four sided crib which is built to an operational height. Each chock is secured to its neighbour by the provision of alignable notches in the upper and lower surfaces thereof so that notches in neighbouring chocks interlock to produce a secure pillar like structure.

The identically sized chocks are manufactured from single blocks of timber and therefore are subject to the following disadvantages:

i) each chock is of unit size and so does not always ensure a secure contact between the uppermost chock and the roof of the tunnel;

ii) since each chock is subject to compression the disadvantage identified in (i) means that the crib requires additional securing through the use of wedges, inflatable grout bag and the like; and

iii) the disadvantage identified in (ii) means that one needs to continually monitor of the supporting height of the crib. Typically, the uppermost chock periodically requires "re-wedging", ie the addition of further wedges to ensure the crib provides continued support, or the addition of settable grout/concrete to the grout bag.

Given the disadvantages associated with the prior art it is desirable to provide a support crib that can be built to a selected operational height without the need to resort to the use of wedges or grout bags and, moreover, to provide a crib support that also ideally can resist compression.

It is therefore an object of the invention to provide a plurality of members for use in the construction of a mine support crib, wherein the summed height of said members is substantially equal to the height of a roof to be supported thereby thus dispensing with the need to use wedges, grout bags or the like.

It is a further object of the invention to provide a support system comprising a plurality of component parts, at least one of which is adjustable in at least one dimension.

It is a further object of the invention to provide at least one member for use in said crib wherein said member comprises a selected number of adjacent structures whereby the selective positioning of a plurality of said structures determines the dimension of said member along at least one axis.

It is yet a further object of the invention to provide a support system for use in supporting tunnels during or after excavation.

According to a first aspect of the invention there is provided a crib member for use in a mine support crib comprising a main body part including a plurality of members which are joined theretogether, and an interlocking part comprising a plurality of block members which are joined to said main body part so that spaces are provided between same; whereby said spaces can be used to interlock adjacent crib members when positioned next to each other.

According to a further aspect of the invention there is provided a crib support system comprising a plurality of crib members wherein at least one crib member comprises a main body part including a plurality of members which are joined theretogether, and an interlocking part comprising a plurality of block members which are joined to said main body part so that spaces are provided between same; whereby said spaces can be used to interlock adjacent crib members when positioned next to each other.

In a preferred embodiment of the invention said main body part comprises a plurality of identically sized members. Alternatively said main body part

comprises members of different height but the same length and width. Most preferably still said members are elongate.

It will therefore be apparent to those skilled in the art that the fixing together of a variable number of members to provide the main body part will affect the height of the crib member, and more particularly, the height of said crib support system as these crib members are built one on top of the other.

Ideally said main body part comprises at least 2 members and ideally 2-5 members.

In a preferred embodiment of the invention said block members are provided on both the uppermost side and lowermost side of said mainbody part, and ideally in aligned fashion whereby said spaces are aligned.

More preferably still each of said block members are of the same size, regardless of their position.

More preferably yet, said block members comprise outer block members and inner block members, with respect to their positioning on said mainbody part.

In an alternative embodiment of the invention inner block members are of a different size to outer block members and ideally of a different length, but, ideally, of the same height and width. More preferably still, said outer block members are made from compressive resistant material (eg steel,).

Ideally said crib members are square in section, this arrangement is preferred when crib members are used to build a rectangular crib support system. However said crib members may be triangular in section thus providing for a

triangular crib support system which may usefully be postioned in a corner or the like.

It will be apparent to those skilled in the art that where said block members are square in section or rectangular they are shaped so as to provide spaces of square section.

However in an alternative embodiment of the invention at least one surface of said block member, ideally an outer block member, is inclined, ideally the inclined surface is the one defining a transverse axis of said main body part when said block member is joined to said main body part. Ideally further still said surface is inclined inwardly with respect to said main body part thus acting as a guide means whereby a neighbouring chock can be guided into said interlocking part. More ideally still said angle of inclination is of at least 15^0 and preferably between $15 - 20^0$.

As mentioned, it will be apparent to one skilled in the art that the provision of an inclined block surface means that said block can act as a guide means or ramp reducing lateral movement thus facilitating the accurate alignment of crib members and providing a stable support structure. For example, a crib member which interlocks with a crib member immediately beneath same bears against the base of the inclined surface and the opposite surface of an upstanding block member; this arrangement helps reduce lateral movement, please Figure 8.

It will also be apparent that block members may be provided so that spaces on said upper or lower surface of said main body part are the same or different width. Further, within one, or different, crib support systems, block members of different height may be provided.

In a preferred embodiment of the invention the height of said mainbody part is greater than the height of a block member attached to one side thereof and ideally twice as high. Ideally a block member is attached to both sides of said main body part such that the height of said mainbody part is equal to the summed height of said block member on either side thereof.

In a preferred embodiment of the invention said block members are positioned so as to provide interlocking parts or spaces postioned at or towards the ends of the crib member.

In yet still a further preferred embodiment of the invention there is provided a crib member according to any previous aspect or embodiment of the invention wherein said crib member is further provided with at least one aperture, or throughbore, through which, or into which, a securing pin can be positioned.

In a preferred embodiment of the invention said aperture, or throughbore, is positioned such that apertures or throughbores in neighbouring crib members can be aligned thereby enabling a securing pin to be positioned, at least partially, through a plurality of said crib members thus fixing adjacent crib members theretogether.

In yet still a further preferred embodiment of the invention said securing pin is manufactured from any robust material, for example, and not by way of limitation, a hardwood dowl or metal pin.

It will be apparent to one skilled in the art that securing pins function to provide a more stable assembled support system with reduced lateral

movement between component crib members and so help to produce safer mine support cribs.

In a further preferred embodiment of the invention said crib members are further adapted by the provision of at least one friction enhancing layer which is ideally is provided on at least part of at least one block member and ideally a mating surface of said block member.

It will be apparent to one skilled in the art that the provision of a friction enhancing layer between assembled crib members will reduce lateral movement and provide a stable assembled support system. Friction enhancing materials are well known in the art and include, by example and not by way of limitation, glass paper, emery paper and the like.

The crib member of the invention offers considerable advantages over prior art mine support systems, for example, and not by way of limitation:

(i) Ease of manufacture. The elongate members described in US 5,746,547 have to be machined shaped from solid blocks of timber. To provide elongate members of varying height would be impracticable since the equipment used in their manufacture would require adjustment and blocks of wood of differing dimensions would have to be provided. In contrast, because the crib members of the invention are laminated they can be constructed from timber of different sizes typically available in the industry. Consequently the crib members of the invention are less wasteful in terms of timber usage

(ii) The crib members of the invention are inexpensive to manufacture. Moreover, the timber forming the body of the crib

member are fixed to each other by conventional means using relatively unskilled labour.

(iii) The laminated nature of the member provides means for altering the height of said member and additionally, and/or advantageously, the laminate structure allows for the manufacture of crib members from different timber or alternate materials. For example, and not by way of limitation, crib members can be manufactured from different timber species. Alternatively, crib members can be manufactured from a combination of timber and/or other materials (for example, and not by way of limitation, metals, reinforced plastic).

In a preferred embodiment of the invention there is provided a crib member wherein said member is manufactured from timber of a single species.

In yet a further preferred embodiment of the invention said species is a hardwood species.

In yet still a further preferred embodiment of the invention there is provided a crib member wherein said member comprises parts made from different timber species.

It will be apparent to one skilled in the art that depending on the availability of timber species the crib member of the invention may be manufactured from material that is in abundance or can be at least easily acquired.

In yet still a further preferred embodiment of the invention said crib member comprises parts made from at least two different materials.

It will be apparent to one skilled in the art that it is be possible to manufacture the main body part using different materials which are combined in a suitable ratio to provide a support structure that has desired load bearing properties. For example, and not by way of limitation, by the combination of timber and steel parts.

According to a further aspect of the invention there is provided a support system comprising a plurality of crib members according to the invention.

Preferably said support system has a rectangular geometry. More ideally still said geometry is square.

In an alternative embodiment of the invention said support system has a triangular geometry.

According to yet a further aspect of the invention there is provided a crib support system comprising a plurality of crib members according to the invention wherein said crib members are provided with a single, inner interlocking space so that, in use, they are stacked in a crossed fashion.

It will be apparent to one skilled in the art that the arrangement of crib members in a crossed fashion provides a support system which may be used in regions of subterranean excavation where a crib support system of rectangular or triangular construction would not easily fit. We refer to this arrangement as a crossed crib support. Additionally, in areas requiring increased support, the crossed crib support may be used in addition to a square and/or rectangular and/or triangular support system according to the invention.

According to a fifth aspect of the invention there is provided a method for constructing a support crib according to any previous aspect or embodiment of the invention comprising:

(i) providing crib members according to the invention;

(ii) assembling said crib members into a support crib according to the invention; and

(iii) contacting and/or securing the uppermost crib member(s) of said support crib to the area to be supported.

In a preferred method of the invention the central cavity created when the support crib has been assembled is filled with a suitable filler to provide additional compression support of the load. Ideally said filler is concrete.

According to a sixth aspect of the invention there is provided a crib support kit comprising:

(i) a selected number of crib members, optionally, said crib members may be of the same dimensions or, of different height; and/or

(ii) a selected number of block members as hereindescribed; and a selected number of main body parts as hereindescribed and optionally;

(iii) filler, ideally quick set concrete or grout.

According to a seventh aspect of the invention there is provided a crib member as substantially hereindescribed and/or with reference to the description and drawings.

According to a eigth aspect of the invention there is provided a crib support system as substantially hereindescribed and/or with reference to description and drawings.

An embodiment of the invention will now be described by example only and with reference to the following figures;

Figure 1 shows a side perspective view of a crib member;

Figure 2a shows a front, end perspective view of part of a crib member;

Figure 2b shows a front, side perspective view of part of a crib member;

Figure 3 shows a side perspective view of a pair of interlocked crib members;

Figure 4 shows a fully assembled support crib at an operational height;

Figure 5 is a load displacement graph illustrating the load bearing properties of the assembled support crib including a dated test certificate;

Figure 6 shows an alternative embodiment of crib members in accordance with the invention. Figure 6a shows a pair of unlinked crib members; Figure 6b shows a pair of linked crib members; and Figure 6c shows an assembled support system with upper and lower securing members; this arrangement of crib members is referred to as a crossed crib support; and

Figure 7a shows the inclined inner surface of an outer block member; Figure 7b shows a pair of interlocked outer blocks.

Referring to Figure 1, a side perspective view of a single crib member is shown (1). The crib member (1) comprises a plurality of elongate horizontal elements (2) fixed to one another, in this embodiment, over the entire length of same to form the mainbody part of the crib member (3). Horizontal elements (2) are joined together by conventional fixing means, for example, and not by way of limitation, nails, screws, staples, adhesives. By varying the number of horizontal elements the height of the crib member may be accordingly varied.

Attached to an upper surface (4) of the main body part (3) are spaced block members (7, 8) which define two spaced indentations (5). In this embodiment the blocks are sized and positioned so that the indentations are positioned toward the ends of the crib member and are square in section (6). In other embodiments the blocks may be alternatively positioned so as to provide, for example, a single, ideally central indentation. Moreover the blocks may be fashioned so as to provide an alternate section, for example, the blocks may be provided with at least one angled side so as to provide an indentation of angled, as opposed to square section. In this latter embodiment adjacent blocks may require suitable fashioning so as to enable neighbouring crib members to lock theretogether.

The indentations (5) of the first surface (4) are formed by fixing timber blocks (7) to the outermost ends of the crib member and a spacer timber block (8), (of identical height and width, but different length, to the outer block (7)), to the inner part of the crib member.

The compression stress is greatest at the ends of the crib member and these sites are most prone to fracture. Advantageously, if the timber blocks (7) fracture they can be it may be easily replaced. In crib members carved from a single piece of solid timber, (as in WO 5 746 547), this is not an option since physical fracture at these positions necessitates the partial dismantaling of the

crib support and replacement of the damaged crib member. This may render the tunnel supported by the crib support susceptable to collapse. More advantageously, the vunerability to fracture of the outer blocks (7) may be addressed by fixing blocks manufactured from materials more able to withstand the compressive stress imposed by the tunnel roof. For example, and not by way of limitation, blocks (7) may be made from steel or reinforced plastics.

A lower surface (9) of the main body part (3) is similarily built as aforedescribed using outer timber blocks (10) and a spacer block (11). Notably blocks (7) and (10); and blocks (8) and (11) are suitably aligned so that the corresponding indentations that they define are also aligned.

Referring to Figures 2a and 2b, the ends of two crib members are shown in perspective view. Please note that although these two crib members are of identical construction crib members having a different number of horizontal elongate elements (2), forming the body of the crib member (3), may be used; whereby the height of a crib member can be varied. Additionally or alternatively, block members of different height may be used;whereby, again, the height of the crib member can be varied.

Thus the resulting crib members may be provided in a variety of sizes so that the height of a support crib may be engineered whereby the height of a support crib is proportionate to, or the same as, the height of the tunnel to be supported.

The crib members interlock by alignment of indentations (5) (please see arrow). Thus, the support crib is sequentially assembled by the alignment and interlocking of crib members.

Figure 3 shows a pair of interlocked crib members. The indentation (5) is of sufficient depth to allow neighbouring crib members to be locked theretogether in an aligned manner so providing a discontinuous upper horizontal surface which is suitable for supporting the next layer. Assembly continues until the crib support is erected to an operational height sufficient to contact the roof to be supported.

Figure 4 represents an assembled crib support. The crib support is ideally assembled on a level, and suitably firm floor, of a tunnel to provide a secure foundation for the support crib. If additional compression resistance is required the cavity formed within the assembled crib support may be filled with a suitable material. For example, and not by way of limitation, concrete or a settable grout.

Figure 5 shows a graph representing the displacement of an assembled support crib, measured in millimetres, when subjected to a downward vertical force, measured in tonnes. It will be apparent that the support system of the invention more than satisfies the safety requirements imposed by the authorities which regulate this industry. Moreover the load bearing properties of the support crib exceeds that of prior art support cribs (please see US 5,746,547) by a minimum of 20% . We attribute the superior function of our mine support crib to the fact that crib members are manufactured as a laminate structure. Defects in wood used to manufacture crib members from single blocks of wood result in a support crib having inherent deficiencies. The use of a laminate structure allows any material defects to be reduced. In addition the lamination also results in a support crib having the following beneficial features over prior art crib supports;

i) a stronger support crib

ii) a less expensive support crib

iii) a less wasteful support crib

iv) a safer, more stable support crib

v) a support crib that can be manufactured from a number of timber species.

Referring to Figure 6a, an alternative embodiment of the support crib is illustrated and referred to as a crossed crib support. The crib members (1), in this example, are characterised by the attachment of two spaced outer block members (7, 10) to both an upper and lower surface of the main body part. Each pair of block members thus provide a space (5) into which an adjacent crib member is interlocked in a crossed fashion. Figure 6b illustrates the crossed interlocking of crib members. This crossed arrangement of crib members provides a smaller support crib which is used to prop regions of , typically, a mine tunnel, in which a support crib as aforedescribed, could not be assembled due to, for example restrictions of space. Alternatively, the crossed crib prop support is used in addition to a mine support crib according to the invention. Figure 6c illustrates an assembled, crossed crib prop support.

Figure 7 is an end view of outer block members fixed to the mainbody part illustrating the inclined inner surface (12) of the outer block member (7, 10). The provision of the inclined surface serves two functions. Firstly it acts as a guide means to ensure that crib members are correctly aligned in the crib support. Crib supports are typically 10 – 16ft in height and require careful assembly to ensure a support system is stable. Variations in the alignment of crib members can result in a support system that is unable to provide maximun compression resistance. Secondly, the inclined surface (12) locks the crib members against the base of the inclined surface (13) and the opposite surface (14) of an upstanding inner block member thereby reducing lateral movement of the crib members within the support system.

It will be apparent to one skilled in the art that the crib support of the invention is adaptable because it comprises crib members of any selected height; so enabling tunnels of different sizes to be supported securely. The crib support of the invention is useful in any underground excavation requiring roof support. For example, and not by way of limitation, coal mines, tin mines, gold mines, diamond mines.

CLAIMS

1. A crib member for use in a mine support crib comprising of a main body part including a plurality of members which are joined theretogether, and an interlocking part consisting of a plurality of block members which are joined to said main body part so that spaces are provided between same whereby said spaces can be used to interlock adjacent crib members when positioned next to each other.

2. A crib support system comprising a plurality of crib members wherein at least one crib member comprises a main body part including a plurality of members which are joined theretogether and an interlocking part comprising a plurality of block members which are joined to said main body part so that spaces are provided between same; whereby said spaces can be used to interlock adjacent crib members when positioned next to each other.

3. A crib member according to Claim 1 or 2 wherein said mainbody part comprises a plurality of identically sized members.

4. A crib member according to Claims 1 - 3 wherein said mainbody part comprises members of different height but the same length and width.

5. A crib member according to Claims 1 - 4 wherein said mainbody part comprises at least two members.

6. A crib member according to Claims 1 - 5 wherein said main body part comprises 2 – 5 members.

7. A crib member according to Claims 1 - 6 wherein said block members are provided on both the uppermost side and lowermost side of said main body part.

8. A crib member according to Claims 1 - 7 wherein said block members are in aligned fashion whereby spaces are aligned.

9 A crib member according to Claims 1 - 8 wherein said block members are the same size.

10 A crib member according to Claims 1 - 9 wherein said block members comprise outer block members and inner block members with respect to their positioning on said main body part.

11 A crib member according to Claim 10 wherein said inner block members are of a different length to said outer block members but the same height and width.

12 A crib member according to Claims 1 - 11 wherein said crib members are square in section.

13 A crib member according to Claims 1 – 11 wherein said crib members are triangular in section.

14 A crib member according to Claims 10 - 13 wherein said outer block member has an inclined surface.

15 A crib member according to Claim 14 wherein said inclined surface is that defining a transverse axis of said main body part.

16 A crib member according to Claim 14 or 15 wherein said inclined surface is inclined inwardly with respect to the main body part thereby acting as a guide means whereby a neighbouring crib member can be guided into said interlocking part.

17 A crib member according to Claims 14 – 16 wherein said inclined surface is an angle of at least 15^0.

18 A crib member according to Claims 14 – 17 wherein said angle of inclination is between $15^0 - 20^0$.

19 A crib member according to Claims 1 - 18 wherein the height of said main body part is greater than the height of said block member attached to one side thereof.

20 A crib member according to Claim 19 wherein said main body part is twice as high as said block member.

21 A crib member according to Claims 19 or 20 wherein said block members are attached to both sides of said main body part such that the height of said main body part is equal to the summed height of said block member on either side thereof.

22 A crib member according to Claims 1 - 21 wherein said block members are positioned to provide interlocking parts positioned towards the ends of said crib member.

23 A crib member according to Claims 1 - 22 wherein said crib member is provided with at least one aperture or throughbore, into which or through which a securing pin can be positioned.

24 A crib member according to Claim 23 wherein said aperture or throughbore is positioned such that apertures or throughbores in neighbouring crib members are aligned thereby enabling a securing pin to be positioned, at least partially, through a plurality of said crib members and fixing adjacent crib members theretogether.

25 A crib member according to Claims 1 - 24 wherein said crib members are provided with at least one friction enhancing layer which is provided on at least part of at least one block member.

26 A crib support system according to Claim 2 comprising a plurality of crib members according to Claims 1 - 25.

27 A crib support system according to Claims 2 or 26 comprising a plurality of crib members according to Claims 1 - 25 wherein said crib members are provided with a single, inner interlocking space so that in use they are stacked in a crossed fashion.

28 A method to construct a support crib comprising:

i) providing crib members according to Claims 1 - 25;

ii) assembling said crib members into a support system according to Claims 2 or 26 or 27; and

iii) contacting and/or securing the uppermost crib member of said support crib to the area to be supported.

29 A method to construct a support crib according to Claim 28 wherein the central cavity created during support crib assembly may be filled with a suitable filler to provide additional compression support.

30 A kit comprising; a selective number of crib members according to Claims 1 or 3 -25 of the same or different dimensions; a selected number of block members; a selected number of main body parts; and filler, ideally quick set concrete or grout.

31 A crib member as substantially herein described and/or with reference to the description and drawings.

32 A support system as substantially herein described and/or with reference to the description and drawings.

The Patent Office

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): E1E; E1H HJA

Int Cl (Ed.6): E02D; E21D

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2313390 A	(Longleys (Barnsley) Limited)	-
A	GB 2306527 A	(Strata Products (USA) Inc)	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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